



## The butterflies of the Greek island of Límnos (Lepidoptera : Hesperioidea & Papilionoidea)

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**Samenvatting.** De dagvlinders van het Griekse eiland Límnos (Lepidoptera :  
Hesperioidea & Papilionoidea)

Na een korte omschrijving van de geografische ligging van het Griekse eiland Límnos en een overzicht van de geschiedenis van het lepidopterologisch onderzoek presenteert de auteur zijn persoonlijke waarnemingen gedaan in de periode van 12 tot 16 juni 1987. Daarna volgt een analyse van de biogeografie van de dagvlinders van Límnos. Hierbij worden de ecologie, faunistiek en systematiek alsook de paleogeografie besproken. Een vergelijking wordt gemaakt met de fauna van Noordoost-Griekenland en van het eiland Lésvos. Hierbij worden 2 soorten van het eiland Lésvos als nieuw voor de Griekse fauna vermeld, nl. *Hipparchia pellucida* (STAUDER, 1923) en *Maniola megalá* (OBERTHÜR, 1909). Waarschijnlijk wordt Límnos hoofdzakelijk bevolkt door dagvlinderpopulaties afkomstig van Noordoost-Griekenland en niet van Klein-Azië. De kolonisatie van het eiland Lésvos door Aziatische elementen gebeurde waarschijnlijk in een vrij recent verleden, nadat beide eilanden reeds van elkaar gescheiden waren door de zee. Zo konden deze soorten het eiland Límnos niet bereiken.

**Résumé.** Les papillons diurnes de l'île grècque de Límnos (Lepidoptera : Hesperioidea & Papilionoidea)

Après une brève exposition de la situation géographique de l'île de Límnos et un aperçu de l'histoire de la recherche lépidoptérologique l'auteur présente ses observations personnelles effectuées pendant la période du 12 au 16 juin 1987. Ensuite la biogéographie des papillons diurnes de Límnos est analysée. Pour cela l'écologie, la faunistique, la systématique ainsi que la paléogéographie sont discutées. Une comparaison est établie avec la faune du NE de la Grèce et de l'île de Lésvos. Par cette occasion 2 espèces se trouvant sur cette dernière île sont mentionnées comme nouvelles pour la faune grècque: *Hipparchia pellucida* (STAUDER, 1923) et *Maniola megalá* (OBERTHÜR, 1909). Probablement l'île de Límnos est-elle peuplée essentiellement de populations de papillons diurnes originaires du NE de la Grèce et non d'Asie Mineure. La colonisation de l'île de Lésvos par certains éléments asiatiques est probablement assez récente, après que les deux îles aient été séparées par la mer. Ainsi ces espèces ne purent pas atteindre l'île de Límnos.

**Key words :** butterflies - Límnos - Lésvos - faunistics - ecology - paleogeography - biogeography - *Hipparchia* - *Maniola* - *pellucida* - *megalá*.

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## INTRODUCTION

The Northern Aegean islands (Thássos, Samothráki, Límnos and Ágios Efstrátios) are lepidopterologically among the least explored areas of Greece. The present contribution aims at giving an exhaustive survey of the known butterfly fauna of the island of Límnos. The geographic position of the island is shown on map 1. As one can see it is situated well into the sea, roughly equidistant from Halkidiki (Áthos peninsula), Samothráki and Turkey, according to KOUTSAFTIKIS (1970) at resp. 35, 33 and 42 km. The distance from the island of Lésvos is a little greater. The area of the island is 477 km<sup>2</sup>.

There are only very few old butterfly records from Límnos : MATHEW (1898) mentions 5 species from the immediate vicinity of Mírina. A few more records, of which 4 are new to the island, are mentioned in two publications by REBEL (1934; 1937), based on some random butterfly collecting by the herpetologist Franz WERNER. A first systematic survey of the butterfly fauna of Límnos is available with a thesis by KOUTSAFTIKIS (1970). I have some reservations about the real occurrence of two taxa on the island that have been found by KOUTSAFTIKIS alone, viz. *Hipparchia fatua* and *Coenonympha pamphilus*. My reasons are given in the systematic part.

For the sake of completeness all original literature records will be included in the systematic part. Compilations based only on previous literature records include the following : BERNARDI (1961; 1971), KOUTSAFTIKIS (1973a, b; 1974), TAUBER & TAUBER (1968). With a few exceptions no further mention of these publications will be given.

In order to investigate the butterfly fauna of Límnos I visited the island from 12 to 16 June 1987. All localities visited by KOUTSAFTIKIS and by myself are shown on map 2.

## SYSTEMATIC PART

All localities visited by KOUTSAFTIKIS and by myself are indicated for each species with the number given on map 2. For literature records the bibliographic reference is stated fully, except for the records mentioned in KOUTSAFTIKIS (1970). For these the abbreviation «K» is used. Butterflies recorded by KOUTSAFTIKIS were collected in 1967 and 1968, but for each individual record he mentions only the day and the month. All records from June 1987 are mine. New island records are indicated by an asterisk \*.

### HESPERIIDAE

*Thymelicus sylvestris* (PODA, 1761)

«Lemnos» (locality not specified), 26.V.1927 (F. WERNER leg.) (REBEL, 1934).

1: 13.VI.1987; 6: 12.VI.1987; 8: 14 & 16.VI.1987; 10: 12.VI.1987.

Always associated with meadows and, to a lesser extent, dry areas with grass.

\* *Thymelicus acteon* (ROTTEMBURG, 1775)

3: 15.VI.1987; 6: 15.VI.1987; 8: 14 & 16.VI.1987.

Dry garrigue and meadows. More xerothermophilous than *T. sylvestris*, although both species are often found together.

*Carcharodus alceae* (ESPER, 1780)

6: 12 & 15.VI.1987; 8: 14 & 16.VI.1987; 9: 14.VII (K); 10: 12.VI.1987.



Map 1 : The geographic position of Límnos

Occurs in a wide variety of open biotopes.

\* *Carcharodus orientalis* REVERDIN, 1913

6: 14.VI.1987; 8: 16.VI.1987.

Mainly in dry garrigue, in both recorded cases *C. alceae* also occurred in the same places.

\* *Spialia orbifer* (HÜBNER, [1823])

8: 14 & 16.VI.1987.

Garrigue and on a dry meadow.

#### PAPILIONIDAE

*Papilio machaon* LINNAEUS, 1758

Límnos [Mírina], 2.X.1896 (larvae) (MATHEW, 1898).

1: 11.VII (K); 2: 8.VII (K); 11: 15-22.VII (K).

Personally I did not observe this species.

#### PIERIDAE

*Colias crocea* (FOURCROY, 1785)

Límnos [Mírina], 2.X.1896 (MATHEW, 1898).

1: 13.VI.1987; 2: 8.VII (K); 5: 22.VII (K); 9: 14.VII (K); 13: 17.VII (K); 14: 18 & 24.VII (K).



Map 2 : Localities visited by KOUTSAFTIKIS (1970) and the author (1987)

A list of the localities visited by KOUTSAFTIKIS (1970) and myself is given here. The numbering agrees with the numbering on map 2. 7 out of the 14 localities were visited by me : for these I give a short description of the biotopes.

1. Mírina (records from «Kastro» by REBEL (1937) and KOUTSAFTIKIS (1970) as well as records by MATHEW (1898) refer to this locality. The spot visited by me consisted of a small pine wood (*Pinus*) and wasteland along a path bordering that wood at sea level.
2. Thános.
3. 1 km E. of Thános. Dry rocky slope and dry meadow by the sea.
4. Kondiás.
5. Kornós.
6. 2 km W. of Ágios Dimítrios (100 m). Orchard with adjacent flowery meadows and dry gully with a.o. *Ficus* and *Rubus*.
7. 1 km W. of Ágios Dimítrios (100 m). Dry maquis with *Quercus ilex*, *Cistus* and *Genista*.
8. 2 km E. of Dáfni (100 m). Gully with rich vegetation, including *Ficus*, *Rubus* and *Oleander*, adjacent hill (garrigue with *Cistus* etc.) and nearby meadow; small stream at the bottom of the gully with damp spot at its bank.
9. Livadohóri.
10. Móúdos. Small pine wood by the sea with clearing (*Oleander*) and rocky wall (*Ficus* tree). Also an adjacent dry field was explored.
11. Kamínia.
12. 1 km W. of Kondopoúli (50 m). Grassland with patches of thistles at the side of a small road.
13. Kondopoúli.
14. Pláka.

\* *Aporia crataegi* (LINNAEUS, 1758)

6: 13.VI.1987; 8: 14 & 16.VI.1987.

Found in orchards and on flowery slopes with various bushes and trees.

*Pieris brassicae* (LINNAEUS, 1758)

4: 17.VII (K); 9: 14.VII (K); 10: 9.VII (K); 12.VI.1987; 11: 22.VII (K); 14: 24.VII (K).

*Pieris rapae* (LINNAEUS, 1758)

2: 8.VII (K); 6: 12.VI.1987; 8: 14.VI.1987; 9: 14.VII (K); 11: 22.VII (K).

*Pontia daplidice* (LINNAEUS, 1758)

1: 11.VII (K); 2: 29.VI (K); 4: 15.VII (K); 6: 16.VI.1987; 9: 14.VII (K); 10: 9.VII (K); 11: 22.VII (K); 13: 17.VII (K); 14: 10.VII (K).

I found only one single specimen.

\* *Euchloe simplonia* (FREYER, 1829)

1: 13.VI.1987; 6: 12 & 16.VI.1987; 8: 14.VI.1987; 10: 12.VI.1987 (only observed).

Widespread species occurring mainly in flowery meadows.

## LYCAENIDAE

\* *Callophrys rubi* (LINNAEUS, 1758)

8: 14.VI.1987.

Found flying near *Rubus* and settled at a damp place at the bottom of the gully. Usually one finds the species in dry biotopes (maquis and garrigue).

\* *Satyrrium ilicis* (ESPER, 1779)

7: 15.VI.1987.

A few specimens only, flying around bushes of *Quercus ilex* or settled on violet flowers of *Cistus*, in maquis.

*Lycaena phlaeas* (LINNAEUS, 1761)

Limnos [Mírina], 2.X.1896 (MATHEW, 1898).

Kastro [Mírina], 10.VII.1936 (F. WERNER leg.) (REBEL 1937).

3: 15.VI.1987 (only observed); 4: 17.VII (K); 5: 22.VII (K); 6: 12 & 13.VI.1987; 7: 15.VI.1987 (only observed); 8: 14.VI.1987; 10: 18.VII (K), 12.VI.1987; 14: 24.VII (K).

To be found virtually everywhere, but not in great numbers.

\* *Cupido osiris* (MEIGEN, 1829)

8: 14 & 16.VI.1987.

Flying in a damp area at the bottom of the gully.

*Pseudophilotes vicrama* (MOORE, 1865)

«Lemnos» (locality not specified), 22.V.1927 (F. WERNER leg.) (REBEL 1934).

8: 14 & 16.VI.1987.

Found flying in garrigue.

\* *Glaucopsyche alexis* (PODA, 1761)

8: 14 & 16.VI.1987.

Flying in a damp area at the bottom of the gully and in adjacent garrigue.

*Aricia agestis* (DENIS & SCHIFFERMÜLLER, 1775)

«Limnos - April bis August» (KOUTSAFTIKIS 1973b). Strangely the species is not recorded in KOUTSAFTIKIS (1970).

6: 13.VI.1987; 8: 14 & 16.VI.1987.

Found in garrigue and on dry grassy spots.

*Polyommatus icarus* (ROTTEMBERG, 1775)

Limnos [Mírina], 2.X.1896 (MATHEW 1898).

Kastro [Mírina], 10.VII.1936 (F. WERNER leg.) (REBEL 1937).

6: 13.VI.1987; 8: 14 & 16.VI.1987.

Found at the same places as *A. agestis*, as well as in flowery meadows.

## NYPHALIDAE

\* *Limenitis reducta* STAUDINGER, 1901

6: 12.VI.1987; 8: 14 & 16.VI.1987.

Found at places with shrub and tree growth, flying near bushes of *Rubus*.

\* *Vanessa atalanta* (LINNAEUS, 1758)

8: 14.VI.1987; 10: 12.VI.1987 (only observed).

Mostly in areas with shrubs and trees.

*Vanessa cardui* (LINNAEUS, 1758)

Límnos [Mírina], 2.X.1896 (MATHEW 1898).

3: 15.VI.1987 (only observed); 6: 13.VI.1987.

*Polygonia egea* (CRAMER, 1775)

1: 11.VII (K); 5: 22.VII (K); 9: 14.VII (K); 10: 18.VII (K); 11: 22.VII (K); 13: 17.VII (K).

\* *Argynnis pandora* (DENIS & SCHIFFERMÜLLER, 1775)

6: 12.VI.1987 (only observed); 10: 12.VI.1987.

At Moudros, the butterfly was quite common, flying between the pine trees and in a small clearing.

\* *Melitaea didyma* (ESPER, 1779)

6: 15.VI.1987; 8: 14 & 16.VI.1987.

In flowery meadows and orchards.

*Melanargia larissa* (GEYER, [1828])

«Lemnos» (locality not specified), 25.V.1927 (F. WERNER leg.) (REBEL 1934).

1: 13.VI.1987; 3: 15.VI.1987 (only observed); 6: 12 & 16.VI.1987; 7: 15.VI.1987 (only observed);

8: 14 & 16.VI.1987; 10: 12.VI.1987; 12: 13.VI.1987.

Flowery meadows, often sitting on the heads of flowering thistles.

*Hipparchia fatua* (FREYER, 1845)

9: 14.VII (K); 11: 22.VII (K).

Surprisingly, this record is not mentioned again in KOUTSAFTIKIS (1974b). Confirmation is needed.

*Maniola jurtina* (LINNAEUS, 1758)

«Lemnos» (locality not specified), VI.1927 (F. WERNER leg.) (REBEL 1934). «Lemnos» (TAUBER & TAUBER 1968).

1: 13.VI.1987; 2: 8.VII (K); 3: 15.VI.1987 (only observed); 4: 17.VII (K); 5: 22.VII (K); 6: 12, 13,

15 & 16.VI.1987; 7: 15.VI.1987 (only observed); 8: 14 & 16.VI.1987; 9: 14.VII (K); 10: 9.VII (K),

12.VI.1987; 11: 22.VII (K); 12: 13.VI.1987; 14: 18.VII (K).

On Límnos the most common species, occurring virtually everywhere with a preference for grassland, but also in areas of dry maquis (e.g. at 7). Both sexes found hiding in great numbers in bushes of *Rubus* and of thistles. Also in great numbers on flowers, mainly of blue colour, especially in the early morning and in the late afternoon.

*Coenonympha pamphilus* (LINNAEUS, 1758)

10: 18.VII (K); 11: 27.VII (K).

*C. pamphilus* is a common grassland species. On the island of Lésvos I had no difficulties in tracing this inconspicuous butterfly in early June 1986, in late May 1987 and in the third week of June 1987 (just after my visit to Límnos). Therefore, as I did not encounter it at any place on this island, I have many doubts about its occurrence here.

*Lasiommata maera* (LINNAEUS, 1758)

2: 8.VII (K); 4: 17.VII (K); 10: 18.VII (K); 11: 22.VII (K); 14: 24.VII (K).

## BIBLIOGRAPHY OF THE BUTTERFLIES OF LÍMNOS

KUDRNA (1986: 217) gives the following broad definition of biogeography: «Biogeography is the study of the patterns of distribution of organisms in space and time». Here I consider especially ecological data, faunistics, systematics and paleogeography to be crucial for a better understanding of the observed distribution patterns of the butterfly species on the Northern Aegean islands.

### Ecology

Adequate literature on butterfly ecology is scarce. In the following ecological classification of the butterflies of Límnos I largely follow the

concept of butterfly formations as presented in KUDRNA (1986 : 271-279). For precise definitions of the various terms used the reader is referred to that work.

Table 1

Taxon	Ubiquists	Mesophils			Xerothermophils		
		G	SN	N	G	SN	N
<i>Thymelicus sylvestris</i>		x					
<i>Thymelicus acteon</i>					x		
<i>Carcharodus alceae</i>					x		
<i>Carcharodus orientalis</i>					x		
<i>Spialia orbifer</i>					x		
<i>Papilio machaon</i>			x				
<i>Colias crocea</i>			x				
<i>Aporia crataegi</i>			x				
<i>Pieris brassicae</i>	x						
<i>Pieris rapae</i>	x						
<i>Pontia daplidice</i>					x		
<i>Euchloe simplonia</i>					x		
<i>Callophrys rubi</i>						x	
<i>Satyrium ilicis</i>						x	
<i>Lycaena phlaeas</i>		x					
<i>Cupido osiris</i>			x				
<i>Pseudophilotes vicrama</i>					x		
<i>Glaucopsyche alexis</i>					x		
<i>Aricia agestis</i>					x		
<i>Polyommatus icarus</i>		x					
<i>Limenitis reducta</i>			x				
<i>Vanessa atalanta</i>			x				
<i>Vanessa cardui</i>	x						
<i>Polygonia egea</i>						x	
<i>Argynnis pandora</i>							x
<i>Melitaea didyma</i>			x				
<i>Melanargia larissa</i>					x		
<i>Hipparchia fatua</i>						x	
<i>Maniola jurtina</i>		x					
<i>Coenonympha pamphilus</i>		x					
<i>Lasiommata maera</i>					x		

Used abbreviations :

G : grassland species (also other open formations like garrigue are considered here)

SN : seminemoral species

N : nemoral species

In this table I have only mentioned the main type of formation to which each species belongs on Limnos. Of course this restriction is made for convenience only, as e.g. xerothermophilous grassland species can very well be found in a flowery meadow, flying with typical mesophilous grassland species (*Thymelicus sylvestris* and *T. acteon* flying together at 6 etc.). Often it is also very difficult to draw a line between different categories (e.g.

*Polyommatus icarus* can be considered mesophilous as well as xerothermophilous). In such cases the choice must remain somewhat arbitrary.

The absence of hygrophils is characteristic on Límnos. Most of the butterflies occurring on Límnos are grassland (and garrigue) species (16 sp.), followed by seminomoral species (11 sp.), ubiquitous (3 sp.) and nemoral species (1 sp.), occurring in disturbed habitats. This agrees very well with what one observes on Límnos: very extensive areas of cornfields (unsuitable for butterfly life), bordered by small grassy spots with flowers (fig. 1) and extensive areas of dry garrigue. I could observe most butterflies on flowery meadows (various localities), in orchards (locality n° 6) and in the nice gully near Dáfni (locality n° 8): in the latter I found 20 species (64,5% of the recorded species on the island). This could imply that there was a greater diversity of biotopes on Límnos in the past and, consequently, a greater species richness and diversity. However, as nothing is known of the situation before the negative influence of the anthropogenic factors on the original butterfly fauna started, the impact of these factors cannot be measured.

#### Faunistics

Exhaustive data on the distribution of the butterflies on the island of Límnos have already been given in the systematic part. It is interesting to investigate the occurrence of these butterflies in adjacent areas, as well as to compare the butterfly fauna of Límnos with that of those areas. For this purpose we will compare the situation on Límnos with that in the lowlands of Northeastern Greece and in Asia Minor. For the former area I take into account the Greek provinces of Thráki and Makedonía, from the Turkish border westwards to Thessaloníki, including Halkidikí, for the latter area I restrict myself to the island of Lésvos, that I visited myself three times.

All species recorded from Límnos do also occur in NE Greece; on Lésvos all of them have been found except three, viz. *Callophrys rubi*, *Cupido osiris* and *Maniola jurtina*. (I did not find *Hipparchia fatua* there, but J. COUTSIS (pers. comm.) informs me that he recorded the species on Lésvos in 1967).

It is interesting to note that some Asiatic butterflies do reach the western limit of their distribution on the island of Lésvos, while one does not find them on Límnos nor in NE Greece anymore. These include *Thymelicus hyrax* (LEDERER, 1861), *Hipparchia mersina* (STAUDINGER, 1871), *H. pellucida* (STAUDER, 1923) (1), *Maniola telmessia* (ZELLER, 1847) and *M. megala* (OBERTHÜR, 1909) (2). The absence of both *Hipparchia* species on Límnos could be attributed to the lack of adequate biotopes there. Significant is the occurrence of *Maniola jurtina* on Límnos and in Northern Greece, but not on

(1) Quite surprisingly I found this species at three different localities on Lésvos in June 1986 and in June 1987. Formerly the western limit of its distribution area was supposed to be near Bolu (Prov. Bolu, Turkey), some 500 km to the east of Lésvos! The determination was confirmed by examination of the male and female genitalia. **New for the Greek fauna.**

(2) The nearest locality from where *M. megala* is known is Efes (Prov. Izmir, Turkey). In June 1986 and in June 1987 I found the species at a single locality on Lésvos. Here too, examination of the male genitalia (no females were found) proved conclusive. **New for the Greek fauna.**





Fig. 1 : Typical landscape on Límnos : cornfields bordered by grassy spots with flowers (2 km W. of Ágios Dimítrios, 16.VI.1987) (photograph by A. OLIVIER)

Lésvos, while on Lésvos one finds *M. telmessia* and *M. megala* which are absent further west. This suggests the possible existence of a biogeographic frontier lying between both islands. The situation with *T. hyrax* could be explained in this way too, as also with *Pseudochazara anthelea anthelea* (HÜBNER, [1824]), a taxon that has its western distribution limit on Lésvos (in the Balkans and on Kríti one finds *P. anthelea amalthea* (FRIVALDSZKY, 1845)).

### Systematics

All species occurring on Límnos have a very wide distribution on the mainland. Many of them can be found on the majority of the Greek islands, including the Kikládés. The differentiation of the populations on Límnos can give some clue as to the duration of the present isolation of Límnos from the mainland. It is noteworthy that the populations on Límnos do not differ significantly from the adjacent mainland populations, and that none of these deserves a subspecific name on its own.

### Paleogeography

During Wurm I (115.000 - 72.000 B.P.) the islands of Thásson, Samothráki, Límnos, Lésvos, Híos, Sámos and Kós were connected to the mainland. Only after this time, during the Flandrian transgression, the sea level started to rise, with intermittent periods of transgression and regression (PFANNENSTIEL 1951). An analysis of the Pleistocene mammal fauna of Híos by DERMITZAKIS & SONDAAR (1979) leads these authors to the conclusion that Híos probably became an island only at the very end of the Pleistocene [20.000 years ago ?]. A similar situation could be true for Límnos.

## Conclusions

There are only very few indications from which conclusions can be drawn about the geographic origin of the butterfly fauna of Límnos. All species are ecological «generalists» that have a large distribution area on the mainland and that do not form definable endemic subspecies on Límnos. Almost all information we have (including paleogeography) points to the conclusion that Límnos is inhabited by euryocuous widespread species that arrived here in recent times or that the populations of these species occurring here became recently isolated from adjacent mainland populations. However, data on the distribution of the *Maniola* species on Lésvos, Límnos and in NE Greece do support the view that the butterfly species occurring on Límnos mostly came here from NE Greece and not from Asia Minor, some barrier existing between the latter area and Límnos in the recent past.

The recent geographic isolation of Límnos from the adjacent mainland points to a very late colonization of Lésvos by Asiatic elements, after the contact between both islands was broken by the sea so that these taxa were unable to reach Límnos. There exists a possibility that these Asiatic species once occurred on Límnos too and became extinct later, but as this would then be the case with several taxa, some of which are ecologically very tolerant, this is more unlikely.

## BIBLIOGRAPHY

- Bernardi, G., 1961. Biogéographie et spéciation des Lépidoptères Rhopalocères des îles méditerranéennes. *Colloques int. Cent.natn.Rech.scient.* 94 : 181-215.
- Bernardi, G., 1971. Biogéographie des Lépidoptères Rhopalocères des îles égéennes. *C.r.somm. Seanc.Soc.Biogeogr.* 1971 : 21-32.
- Dermitzakis, M.D. & Sondaar, P.Y., 1979. The importance of fossil mammals in reconstructing Paleogeography with special reference to the Pleistocene Aegean Archipelago. *Annls Géol.Pays Hell.* 29 (1978) : 808-840.
- Koutsaftikis, A., 1970. Vergleichend zoogeographische Untersuchung über die Lepidopterenfaunen der Nordägäischen Inseln Thassos, Samothraki und Limnos. *Diss.Math.Naw. Fak.Univ.Saarlandes*, 134 p.
- Koutsaftikis, A., 1973a. Die Papilioniden Griechenlands. *Annls Mus.Goulandris* 1 : 239-244.
- Koutsaftikis, A., 1973b. Ökologische und zoogeographische Untersuchungen der Lycaenidae Griechenlands (Lepidoptera). *Biol. Hellen.* 5 : 167-179.
- Koutsaftikis, A., 1974a. Ökologische und zoogeographische Beiträge zur Kenntnis der Pieridae Griechenlands (Lepidoptera). *Ber.ArbGem.ökol.Ent.Graz* 4 : 1-5.
- Koutsaftikis, A., 1974b. Zur Ökologie und Chorologie der Satyriden-Fauna Griechenlands (Lepidoptera : Satyridae). *Z.ArbGem.öst.Ent.* 25 (1973) : 120-128.
- Kudrna, O., 1986. *Butterflies of Europe. Vol. 8 : Aspects of the Conservation of Butterflies in Europe.* Aula Verlag, Wiesbaden.
- Mathew, G.F., 1898. Notes on Lepidoptera from the Mediterranean. *Entomologist* 31 : 77-84, 108-116.
- Pfannenstiel, M., 1951. Quartäre Spiegelschwankungen des Mittelmeeres und des Schwarzen Meeres. *Vierteljahrsschr.Naturf.Ges.Zürich* 96 : 81-102.
- Rebel, H., 1934. Griechische Lepidopteren III. *Z. öst.EntVer.* 19 : 55-56, 63-66.
- Rebel, H., 1937. Griechische Lepidopteren IV. *Z. öst.Ent.Ver.* 22 : 63-67.
- Tauber, A.F. & Tauber, W., 1968. Die Gattung *Maniola* (Lep. Satyridae) in der Ägäis. *Ent. NachrBl., Wien* 15 : 78-86.